Healthcare Analytics in Navy Medicine
Perspectives and Methods for Decision-Making

FOCUS ON PROCESS IMPROVEMENT

Improving Process and Performance Using Effective Analytics

Gregory Matthews, MA, Jim Laramie, MS, and Joe Dorris, MA

Navy Medicine's transformation to a high reliability organization (HRO) is well underway. Performance improvement and process improvement are important terms underlying Navy Medicine's objectives of improving quality, safety, access, and the patient experience of care. Performance improvement is Navy Medicine's focus for meeting system-wide objectives by instilling a strong performance improvement culture and embracing high reliability principles and behaviors. Process improvement drives change in the processes at the Command level that may lead to variation in outcomes or performance. Reducing variation in outcomes through continuous process improvement, organizational development, and health systems engineering provides a more uniform experience of care for BUMED patients and furthers Navy Medicine's journey toward becoming a zero-harm organization. All these efforts rely on analytics to define and measure the current state and the future state. The right data in the right hands at the right time will help identify areas for improvement, drive decision-making, and indicate whether improvement efforts are effective.

Whether you are a health system employee or just reading the news, you are probably aware that health care in the U.S. today is rapidly transforming. Spending in the health care sector has been rising faster than inflation for decades, and health systems are striving to provide value by delivering excellent care that improves patient outcomes at lower costs. Specifically, in the world of military medicine, change is coming in the form of compliance with the 2017 National Defense Authorization Act (NDAA). As VADM C. Forrest Faison stated in November 2016, "Our success depends on how well we adapt to those changes and continue to honor the trust placed in our hands every day to care for America's sons and daughters." Change is a constant theme in health care; managing those changes in a positive way is the goal of performance improvement and process Improvement.

Positive change as managed by process improvement work must directly or indirectly improve patient outcomes and the effectiveness or efficiency of the health system. But how do you know what to change, or when and how to change it? Ensuring that changes are favorable requires understanding the current state and the desired future state of the system. Effective analytics support this understanding by measuring and tracking performance and milestones at multiple points before, during, and after improvement efforts to quantify their effectiveness and value.

Performance Improvement Focuses on the End Goal

Successful performance improvement is typically dependent on robust Process Improvement activities to analyze and improve the underlying processes or factors that contribute to the final performance outcome. It starts by recognizing a need for change within the system, then planning how to address that need, executing the change, and measuring whether the change achieves the desired outcome. The need and the outcome might be behaviors or disciplines. "Analytics is the tip of the spear when it comes to recognizing the need for change," said Brian McCormack, the BUMED lead for Project and Portfolio Management in Governance and Standards and a Lean Six Sigma Black Belt. Analytics provide the

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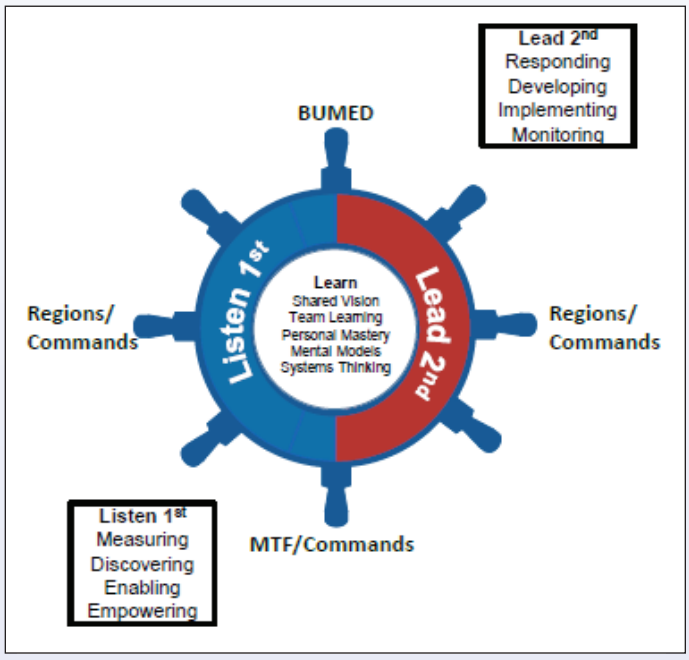
information needed to recognize when and where change needs to occur. Analytics also play a role throughout process improvement initiatives by measuring intermediate outputs and outcomes. Without analytics, it would be impossible to figure out which direction to go and whether or not you ever got to your destination.

One way to understand performance improvement, according to former BUMED Performance Improvement Office (PIO) Executive Director LCDR John Garner (Ret.), is to think of it as "process improvement plus people." By that, he means that the PIO's approach recognizes that the human element is critical in making and sustaining any changes that will improve effectiveness. Performance improvement means a cultural transformation so that staff at all levels and in all functions are ready and willing to improve quality and instill a high-reliability attitude that increases patient safety and access. In practice, reaching this goal requires investment in knowledge management and change management − knowledge management to document methods and innovations that improve performance in various areas, and change management to implement new or modified practices in a way that engages the key stakeholders. To achieve this vision, BUMED performance improvement efforts strive to take a bottoms-up approach by listening before leading. This operating model is symbolized by Figure 1.

Figure 1. The Learning Wheel



Source: PIO. PI Playbook Release 2. Available online. https://es.med.navy.mil/bumed/ED/ED2/Workstream%20Information/PI_Playbook_Release_2_071217.pdf

Process Improvement Creates a Path

Leadership often focuses on the end goals measured by performance metrics and focuses less, or not at all, on intermediate process improvement metrics. This is, in part, a recognition that processes may vary in counteracting ways, having very little impact on the final performance outcome. It also recognizes that processes vary across MTFs and Commands. Such variance can be acceptable if the performance outcome is being met. In engaging robust process improvement, Navy Medicine employs various methods (see Skills and Methods section) and experienced teams knowledgeable in health care performance and process improvement methods. While following structured approaches, process improvement methods must be tailored to address the underlying issues harming performance, whatever those may be. Managing only by performance metrics is insufficient, because a metric falling below a performance threshold does not in and of itself diagnose the problem or prescribe a solution. Instead, BUMED process improvement initiatives are tailored to the identified problem, the facility or department change agent, and the population impacted.

BUMED leadership's emphasis on performance over process is in line with closing remarks at the Flag Officer and Senior Executive Series by Chief of Naval Operations (CNO) ADM John Richardson. The CNO encouraged leaders to focus on outcomes and focus less on measuring the level of effort that those outcomes require. While leadership and the enterprise need to maintain focus on improving performance and outcomes, high reliability tenets require measuring and controlling processes that will partly determine those outcomes. The emphasis on performance keeps everyone's eyes on the end goals rather than the various ways to go about achieving them.

Using Metrics to Assess Performance Improvement Priorities

Performance improvement translates to a set of system-wide objectives that have been prioritized and are continuously measured. BUMED's Performance Improvement Priorities (PIPs) have been laid out in such a way that the desired future state, reflecting the Surgeon General's vision for BUMED to have the best health and readiness in the world, is defined and measurable. Strategic goals are identified from this vision. Goal teams then come up with initiatives they want to accomplish to achieve these strategic goals. In this process, it is important to understand the big picture: both current

and future states. Understanding identifies what needs to be improved, which in turn informs what should be measured. If it is important, measuring at the deck plate (as well as the enterprise level) will ensure action is taken.

Performance metrics describe the current state of the system; when current performance comes up short of the threshold for high performance, then improvement efforts may be deployed. Some of the PIPs include reducing patient harm, improving condition-based quality care, improving access, and increasing direct care primary care capacity. Each of these priorities has an associated measure based on analytics and is continuously measured to gauge improvement. A defining element of Performance Improvement Priorities is that they must be measurable; otherwise, the Navy would not be able to tell when improvement has been achieved. Defining and tracking performance metrics is one function of analytics across the enterprise.

In accordance with the high reliability framework, BUMED does not only focus on facilities or departments that are performing poorly on a particular metric. They also look for facilities or departments that may be satisfactory but could still improve. This is based on the recognition that a good performer today might have trouble next year and again emphasizes reducing the variation in performance for the enterprise as a whole. At the same time, it should be realized that Navy Medicine is a dynamic environment and that standardized processes may begin to become less effective over time. Allowing a variety of processes all intended to get to the same goal, rather than forcing 100 percent standardization also helps the system be more resilient to change. Balancing standardization with some variation also encourages people to be innovative and be motivated to adopt processes that get to the same goal.

Summary

In Navy Medicine today, process improvement initiatives are not limited to single departments or facilities, but tied to the overall performance of the enterprise and the Surgeon General's vision. BUMED is shifting the organizational culture to one of high reliability by engaging all areas of the enterprise in continuous process improvement. Innovative Process Improvements at the point of care will be documented, supported by the Regions, and reviewed and proliferated by BUMED. All areas of Navy Medicine are working together to achieve the mission of a healthy and ready force.

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SKILLS & METHODS

— PERFORMANCE IMPROVEMENT APPROACHES

BUMED's Performance Improvement Office (PIO) established in 2014 and aligned under Enterprise Support Services (ESS) – under the BUMED Executive Director – is leading the way to formally integrate Navy Medicine's performance improvement approaches of Lean Six Sigma (LSS) with Health Systems Engineering (HSE). LSS programs were more culture-focused, providing performance improvement (PI) training directly to clinicians to impart knowledge at the deckplate, while Health Systems Engineering efforts were more project-focused, analyzing data and working with clinical staff to pilot improvements for enterprise role out. LSS and enterprise PI projects (characteristic of HSE efforts) embody many overlapping skills and methodologies but tend to differ in approach, time frame, and the required levels of effort. This section briefly reviews these two PI approaches, their general methods, and the typical knowledge and skills required for successful PI projects.

Navy Medicine is in the process of migrating from the Continuous Process Improvement Management System (CPIMS) to the Strategic Performance Improvement Document Repository (SPIDR) to serve as a knowledge management repository using SharePoint and QlikView that captures and provides status updates for all PI activities across Navy Medicine. SPIDR will lead to an established communication across PI and throughout Navy Medicine, improved reporting capabilities and projection execution, and transparency and accountability for performance, thereby enhancing the visibility of PIO services provided to Navy Medicine and enabling enterprise reporting capability. Through effective knowledge management, initiatives that impact across the enterprise may be referred to BUMED governing bodies for enterprise consideration.

Lean Six Sigma

LSS PI activities are well-entrenched in Navy Medicine with experienced LSS Black Belts embedded at MTFs, the Regions, and headquarters across the command. Once improvement ideas are generated at the local or

regional level, the appropriate individual or governing body approves and prioritizes PI projects.

LSS PI projects are categorized, depending upon the problem or opportunity identified, whether or not processes currently exist to address the issue, whether the root cause is known, and whether or not a solution is known. LSS methodological categories include:

- **DMADV (Define, Measure, Analyze, Design, and Verify)** projects are generally the most extensive in nature and are used to design new processes or enable growth, typically when no process currently exists to address the problem or opportunity.
- **DMAIC (Define, Measure, Analyze, Improve, Control)** projects are typically designed to reduce variation when a process or processes currently exist to address a problem. They are generally less intensive and shorter in duration than DMADVs.
- **RIE (Rapid Improvement Event)** tend to be the most common LSS projects and they are generally fast-paced, short in duration (i.e., several weeks), and focused on making rapid improvements where the root cause is known but the solution is unknown.
- **JDI (Just Do It)** projects are generally "quick hit" in nature and are called for when both the root cause and the solution are known.

Enterprise PI Projects

At the outset of an enterprise PI project, a charter is created to provide direction and goals and identify the project team (e.g., Project Champion, Sponsor, Process Owner, Financial SMEs, Mentors - Master Black Belts, Lead Belt, Team Members, Stakeholders, and Knowledge Managers). These team members' responsibilities are listed in the PIO's Enterprise Performance (PI) Playbook.[1]

Enterprise PI projects generally encompass large systemic issues, and consequently are generally of longer duration, complexity, and intensity than the LSS efforts described above. They have their roots in the HRO Operating Model which includes the MTF CMO, staff, and PI officers tackling issues at the deckplate or MTF/Command level through collaboration with established clinical communities. Specifically, when the MTF CMO briefs the Regional Quality Collaborative and it is determined the solution has enterprise-wide implications, the MTF CMO would recommend a Proposal Initiation Document (PID) be submitted to initiate an enterprise PI project.

Often enterprise PI projects are first approached in a prototype (or pilot) nature, typically requiring up to a year or more to complete. The intent is to roll out lessons learned system-wide across Navy Medicine through additional follow on PI projects. The groundwork and execution of the initial PI pilot project in a focus area are often supported by nationally recognized experts (e.g., Value Based Care pilot at NH Jacksonville [2]) and serve as the blueprint for future role out across Navy Medicine.

While the focus of enterprise PI projects (e.g., ancillaries, clinical, administrative, supply chain) varies from project to project, all projects follow a four-phase lifecycle of initiation, planning, execution, and closure.

Knowledge and Skills

Successful PI initiatives typically require a broad array of knowledge and skills in a multitude of analytic disciplines, supported by clinical and other subject matter experts. Equally important to the analytic skills is a maturity and proficiency in the softer skills required to effectively communicate with onsite stakeholders and leadership and manage the change inherent in PI initiatives. Over-arching these skills is the need for a strong understanding of Navy Medicine and MHS culture, processes, data, and systems.

A main thrust of Navy Medicine PI initiatives is led by persons trained in LSS techniques (e.g., LSS Black Belts). These professionals typically have knowledge and skills in a range of tools, including change management, customer research, failure mode effects analysis/error proofing, value stream mapping, quality function deployment, process simulation, variance analysis, process mapping, root cause analysis, statistical process control, Pareto analysis, benchmarking, and return-on-investment analysis – to name a few. Wrapping around these skills is the need for effective management skills such as those detailed in the PMBOK (Project Management Book of Knowledge) for risk, quality, and material management and communication.

PI initiatives encompassing large systemic issues are long in duration, complexity, and intensity. They are

1 https://es.med.navy.mil/bumed/ED/ED2/Workstream%20Information/PI_Playbook_Release_2_071217.pdf

2 William E. Todd, Alyson Phillips, David C. Collins, Jenny Tsao, The Move to Value-Based Care in Navy Medicine, NEJM Catalyst, April 12, 2017.

often accomplished through the collective contribution of a team of individuals, each contributing knowledge and skills of their particular areas of expertise. Typically underpinning the team are staff educated and trained in industrial engineering. The core skills of industrial engineers (IEs) may be summarized as applying mathematics and engineering methods to improve complex systems operations. This requires a broad systems perspective to problem solving and typically requires a variety of knowledge, skills, and the ability to work well with people. Like LSS Black Belts, which many IEs also are, they routinely use statistical analysis including models and tools such as deterministic spreadsheet tools, mathematical models (e.g., queuing, linear programming, optimization), discrete event simulation models, and network analysis. They are well skilled in decomposing existing processes using techniques such as process flow mapping, demand and capacity analysis, and forecasting of future state alternatives.

The intense data-driven nature of many PI projects requires strong knowledge of MHS data systems, their content, strengths, and limitations. Data analysts with strong knowledge of MHS data systems may be required to augment IEs to provide this domain expertise. Additionally, IEs often conduct on-site time-and-motion studies to collect data not readily available through MHS systems.

Other critical skill sets often required for successful PI projects are data analyst/programmers to conduct analysis of electronic data captured from hospital or other data systems to support the definition of the current state, understand the impact of future state operations, prepare the information for leadership, and develop dashboard metrics and interfaces that meet the needs of stakeholders.

Lastly, critical knowledge and skills for the PI project team generally include subject matter experts with significant clinical expertise and/or analytical expertise in the focus area of the PI initiative. An experienced project leader with knowledge and skills in industrial, management, or systems engineering and with familiarity of Navy Medicine and MHS culture rounds out the PI team. They require strong communication and organizational skills, the ability to plan and direct the team, and serve as primary POC with on-site stakeholders/leadership and BUMED leadership to ensure effective change management and to clear any road blocks that may arise.

DATA AND INFORMATION SYSTEMS

– *DATA AND ANALYTIC STRATEGIES FOR PI EFFORTS*

Process Improvement and Performance Improvement (PI) initiatives require measurement, and the data needed to measure them are specific to that effort. For analysts tasked with data analysis, each data system or set of data elements must be crafted to the specific PI effort at hand. This section suggests a general approach to identifying data sources and analytic strategies that support PI efforts.

Strategy 1: Understand the study questions and how they align with data requirements.

To support a full understanding of PI impacts, it is best to conduct data analysis throughout the PI effort. This includes establishing and quantifying the baseline, assessing intermediate impacts, and determining longer-term impacts on relevant outcome measures. Analysts should have an operational understanding of the full performance cycle. They should understand the business problem, study question(s), processes and process steps implemented, and the staff members and staff skill types contributing to the processes. Consideration of these factors is essential in ensuring that data analysis is relevant, complete, and results in actionable assessments of the PI effort. Further, they should understand the breadth of the process. For example, is the effort specific to a single department, ward, or MTF, or does the PI initiative encompass the entire Service? Establishing this functional level of understanding is critical to aligning data requirements, information capture, and data analysis in an efficient, timely, and applicable manner.

Strategy 2: Understand what data are available, where it can be found, and its limitations.

For many PI efforts, some of the required data already exists, but other required data elements will have to be generated. Existing data may appear in multiple systems - from local department information systems to MTF-level production databases or to central systems repositories (MDR, M2, EAS IV, etc.). As data progresses through the systems, several trade-offs are made with respect to its timeliness, its depth and breadth, and standardization. Data routinely captured at the local department-level are generally the closest to real-time data and have the greatest amount of information available in terms of data capture. However, these local data are less standardized compared to system-level data. Conversely, MHS system-level data

repositories (e.g., MDR, M2) contain the most standardized data but lose much of the detailed information that may be contained at the local-level, such as time stamps associated with PI processes.

A further complication to account for when initiating early stages of PI initiative analysis is the wide range of data capture, storage methods, and systems in place. Individual departments may use methods and systems that are specific to their individual department, that are somewhat uniform across multiple MTFs, or that are implemented system-wide. For example, emergency departments may use either T-Systems, Essentris ED, or department-specific software; operating rooms may store certain department-specific information types (e.g., specific implant information); and other departments might be employing system level solutions such as CHCS/AHLTA. Further, with the evolution of electronic health records, some MTFs have begun to phase in the Cerner Genesis EHR. The use and application of multiple systems and solutions will result in data deficiencies unless knowledgeable staff members are identified at the outset to assist in data retrieval at the appropriate points in the PI lifecycle.

Strategy 3: Understand what data should be generated and the staff involvement required.

Understanding what data are not available from existing data systems is as critical as knowing what data are available. If any required data are not currently being captured, this must be determined and addressed during the PI development stage. Strategies for capturing this missing data should be incorporated into PI implementation activities and monitoring cycles. The team will need to identify the specific data elements, their forms, who will capture them, with what frequency, and how they will be defined. Further, since capture of these data elements may involve monitoring certain staff members and staff types that are unaccustomed to data collection activities, it is important to develop a positive relationship with them. Failing to do so increases the risk of obtaining incomplete, unreliable, and inaccurate data, which can have a significant negative impact upon the assessment and monitoring of PI impacts.

Strategy 4: Align data extraction, generation, and analysis to the time and resources available.

PI projects will have limited budgets and may rely on both project-specific assigned staff and non-project MTF or department specific resources. MTF specific staff members may be needed to provide ad-hoc data pulls and reports from CHCS, Essentris, department-specific or other data systems, because access to these systems may not be available or may be outside the knowledge domain of PI project team members. To accommodate the limited availability of these MTF staff members, clear requirements and timelines should be established and communicated between the PI team and applicable MTF leadership.

In addition, extracting and collecting some data elements may be beyond the level of resources available to a given PI effort. Project goals often exceed project resource availability. During the design phase, PI initiative data analysts will need to convey the amount of resources needed for each data requirement, so that the PI team can rank and order those requirements. Based on this rank-order list and the resource limitations, it may be necessary for the team to define reduced form data requirements and/or develop alternative data solutions.

Strategy 5: Focus not only on target outcome measures, but also on the data associated with the intermediate outcomes and processes. Reducing process variance can be important and relevant, even if the outcome measure remains unchanged.

Outcome metrics often involve some measure of central tendency: a mean, median, or average. That said, sometimes the greatest contributions of PI initiatives are not changes in outcome measures, but in the reduction of the variance associated with outcomes and processes. For example, analysis may show that the average (median) time to treat an ED patient was 120 minutes at PI baseline, and that after PI implementation, this average (median) time to treat an ED patient was unchanged. If one were to simply look at that outcome measure alone, one would likely question the effectiveness of the PI initiative. However, a look at the variance around the median time to treat may show improvement. For example, at baseline, EDs might have variation around the median time to treat from 60 minutes to 12 hours due to some extreme values. A PI initiative might reduce that variation without affecting the median time to treat. In the ED example,

the median after the initiative is still 120 minutes, but the variation around the median ranges now from 30 minutes to just 4 hours. Mathematically, while the median time remained unchanged, the extreme (and arguably most problematic) long stays were eliminated. In this case, the PI initiative reduced variation in the outcome, resulting in improved clinical outcomes, improved patient experience, and reductions in potentially adverse events and patient safety concerns.

In summary, measuring the impact of PI projects requires the early and continuous engagement of analysts. Analysts must fully grasp the purpose, methods, and staff associated with the initiative so that measurement will be meaningful. After reviewing data requirements and considering the limitations of available data, analysts should be able to articulate the trade-offs associated with various data systems and estimate the resources needed to collect the information, allowing the PI team to develop a workable data collection strategy. The PI team will often need to obtain buy-in from stakeholders in other departments to obtain the needed data, so good working relationships are very important. Finally, analyses should consider the variance around processes and intermediate outcomes, as well as the target outcome metrics.

NEW KNOWLEDGE

– NOTED PUBLICATIONS

This recent editorial argues that successful health care transformation efforts must include repetitive, incremental, and small-scale changes in local organizational processes.

The hard work of health care transformation

Bohmer RM. N Engl J Med. 2016 Aug 25;375(8):709-11.

In a recent *New England Journal of Medicine* editorial, Dr. Richard Bohmer, a physician and medical management expert, argues that top management-led structural and governance change often do not guarantee effective operational change in health care systems. Instead, an examination of organizations that have achieved and sustained substantial performance improvements reveals that lasting transformation requires the relentless hard work of local operational redesign.

Bohmer notes that organizations' delivery of care is ultimately governed by structures and processes at the ward, clinic, or practice level. Successful "transformers" constantly make small-scale changes to their structures and processes over long periods, and major change emerges from the aggregation of marginal gain. The delivery of modern health care also requires the work of multi-disciplinary teams that include clinical and non-clinical expertise. When these teams redesign local structures and processes, they do more than write a "best practice protocol," they also reconfigure the workflow, workforce, supporting technology, and even physical care delivery sites.

In studying successful health care organizations, Bohmer emphasizes that teams often redesign local structures and processes despite the lack of senior support, adequate data, capital, or a reimbursement system that rewards their efforts. Instead, transformation requires sustained change in individual behavior, team interactions, and operations design often lead by internal redesign teams led by dedicated physicians and local managers who feel empowered or prepared to lead such efforts.

Finally, Bohmer notes that transforming organizations have a routinized process for change. The basis for their standardized approach to analysis, redesign, improvement, and management varies, but what's most important is not which model — lean manufacturing, continuous improvement, six sigma — is chosen but that the process is internalized, repetitive, and consistent so that the same language is used throughout the organization and independent teams can undertake redesign autonomously. Additionally, transformers have invested in creating a widely-understood set of unifying values and norms to help align staff behavior to guide behavior when there is no clear decision rule.

Many organizations find this approach challenging, because it is slow or requires investment in human assets. In the longer term, however, the prolonged hard work of repetitive, incremental, and often small-scale rebuilding of local operating systems cannot be avoided.

The full article can be downloaded at http://www.nejm.org/doi/full/10.1056/NEJMp1606458#t=article.

TIPS AND TRICKS

– *USING EXCEL FOR DESCRIPTIVE STATISTICS*

This section describes the use of Excel formulas to generate descriptive statistics that are useful in examining process and outcome variation.

As described in the previous section, Performance Improvement Priorities (PIPs) are determined through performance metrics which track measurable data to improve current state of the system, such as increasing access to care. The focus of PI efforts is not just on the bottom performers but also an evaluation of the variation across the players, departments, or facilities. In this section, we will show how to examine the variance, or spread of a univariate measure, as well as other descriptive statistics using Excel formulas.

In previous issues of *Healthcare Analytics in Navy Medicine* (Volume 3, Issues 2 and 3), the Excel Data Analysis ToolPak have been demonstrated as tools to examine data using select descriptive statistics and histograms. Due to IT restrictions on add-ins for Excel on some DoD work stations, many users can no longer utilize the pre-canned options of the ToolPak. This article demonstrates how users can obtain common descriptive statistics with Excel formulas.

EXAMPLE - DESCRIPTIVE STATISTICS

One way to maximize physician office hours is to evaluate whether it would be efficient to offer varied time slots for patient appointments. For example, a clinic may consider having 20- and 40-minute appointment templates based on the type or intensity of appointment. While the MHS Mart (M2) does not have actual appointment times in its data files, RVUs can be used to approximate the workload of each appointment. Figure 2 examines select Evaluation and Management (E & M) codes relating to office visits for new and established patients. The E & M codes vary in intensity of care provided, as well as time, which is reflected in their Relative Value Units (RVUs).

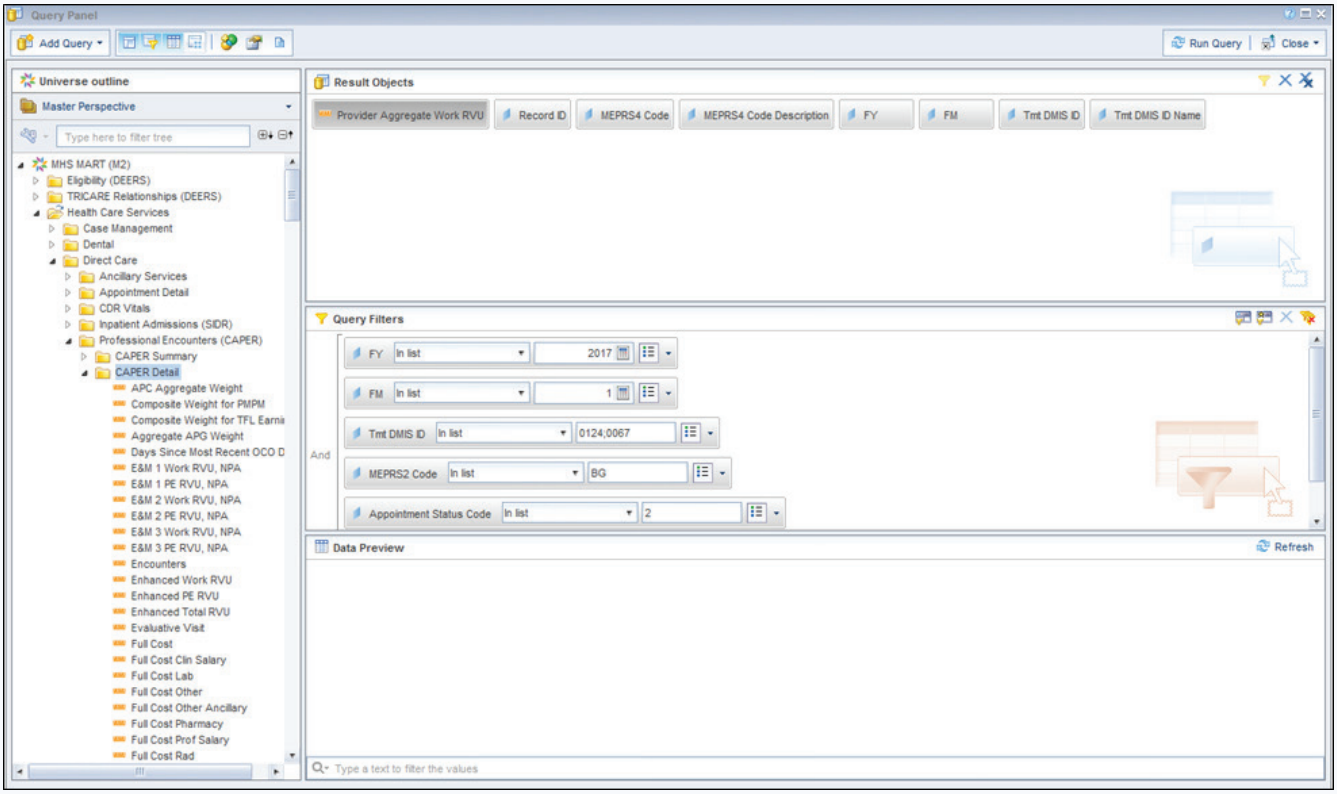
Figure 2. Select Office Evaluation and Management (E&M) Codes

E & M Code	Description	Work RVU
99202	Office/outpatient visit new, low - moderate, 20 min	0.93
99203	Office/outpatient visit new, moderate, 30 min	1.42
99204	Office/outpatient visit new, moderate - high, 45 min	2.43
99213	Office/outpatient visit est, low - moderate, 15 min	0.97
99214	Office/outpatient visit est, moderate - high, 25 min	1.50
99215	Office/outpatient visit est, moderate-high, 40 min	2.11

For this example, pull data for the Family Practice Clinics at Walter Reed (DMIS ID 0067) to examine if the clinic could benefit from varied appointment slots. Figure 3 shows the M2 query panel, which retrieves one month of data (Provider Aggregate Work, RVU) for the Family Practice Clinics (MEPRS 2 Code "BG") at Walter Reed (0067).

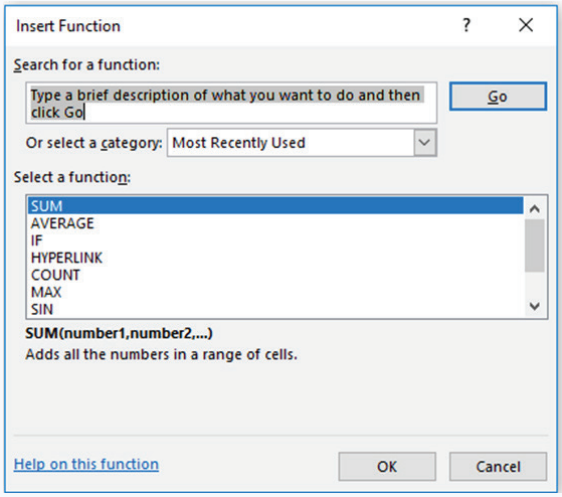
EXAMPLE - DESCRIPTIVE STATISTICS

Figure 3. Provider Aggregate Work, RVU for FY 2017 FM 1 for Family Practice Clinics at Walter Reed



Once data from the M2 report have been exported to Excel, formulas can be used to generate common descriptive statistics. To find the name of the desired formula, search the Insert Function (fx) icon, which is shown in Figure 4. There is a description of the function at the bottom of the function screen, as well as brief directions on the appropriate input parameters. Remember that all Excel formulas start with an equal sign (=).

Figure 4. Insert Function Icon (fx)

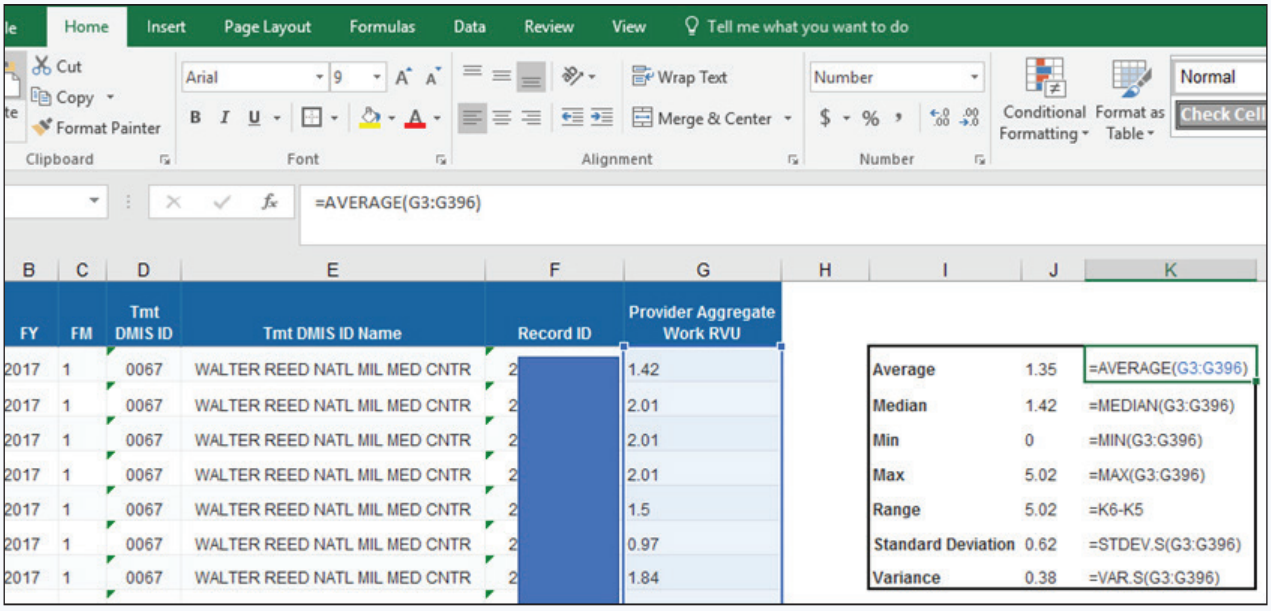


EXAMPLE - DESCRIPTIVE STATISTICS

Figure 5 shows several descriptive statistics generated with Excel formulas that are also part of the ToolPak and provide a better understanding of the data: average, median, min, max, range, standard deviation, and variance. The first formula calculated in Figure 5 is the 'Average' (i.e., median). To input Provider Aggregate Work, RVU into the formula, type "=AVERAGE(", then select the first cell (G3) and hit CTR+Shift+Down-Arrow on your keyboard to go to the end of the column (G396). Close the function formula with ")". The formula will read: "=AVERAGE(G3:G396)".

The average Provider Aggregate Work, RVU for a Family Practice Clinic appointment at Walter Reed is about 1.35, but the median RVU for an appointment is 1.42, which indicates some outliers and not a perfectly normal distribution (i.e., a bell-shaped curve).[3] When the average is less than the median, the data points are skewed to the left, meaning that the majority of the data points (e.g. appointment RVUs) will have values that are less than the median (i.e., within the first 50 percent of the distribution). A smaller number of data points will have higher values above the median and give the distribution a long or skinny tail to the right. Considering also the minimum and maximum (values 0 and 5.02, respectively) also confirms the unevenness of the data spread.

Figure 5. Excel Formulas for Select Descriptive Statistics

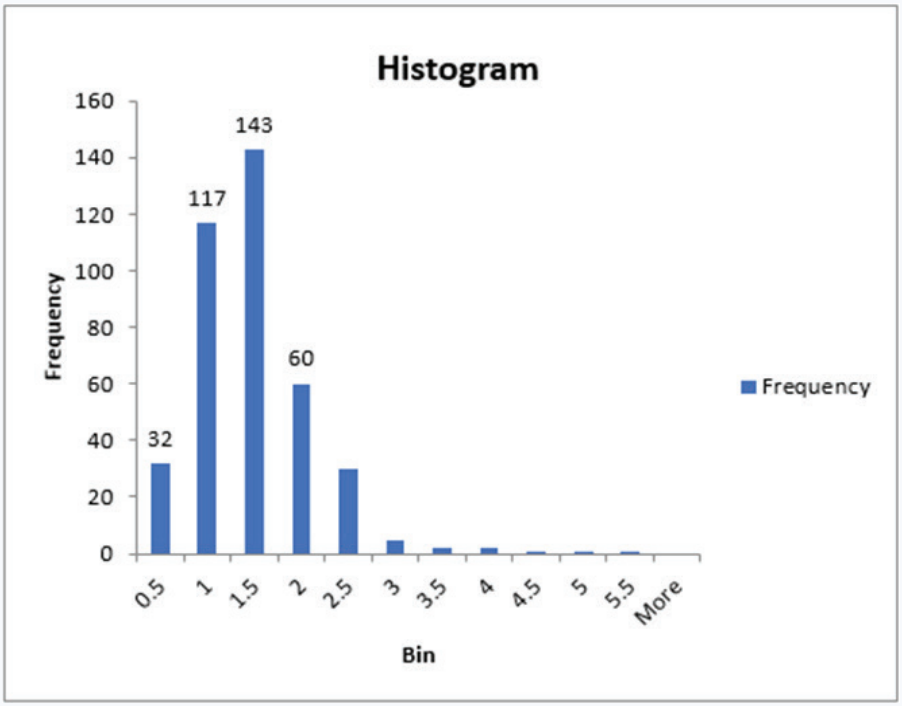


3 An overview of common measures of central tendency and variance can be found in Volume 6, Issue #4 of *Healthcare Analytics in Navy Medicine.*

EXAMPLE - DESCRIPTIVE STATISTICS

The histogram shown in Figure 6 provides a visual representation of the descriptive statistics. The histogram also shows that appointments most frequently generate 1, 1.5, or 2 RVUs (i.e., the bin ranges noted on the x-axis).

Figure 6. Histogram of Provider Aggregate Work, RVUs for Appointments at Family Practice Clinics at Walter Reed (FY 2017 FM 1)



The information in Figures 5 and 6 provides a good argument for multiple appointment lengths when compared to the E&M codes in Figure 2. A low- to moderate-intensity E&M visit is almost 1 RVU and should last 15-20 minutes; a moderate-intensity visit is about 1.5 RVUs and should take about 25-30 minutes; and a moderate- to high-intensity visit is about 2.3 RVUs and should last 40-45 minutes.

KNOWLEDGE SOURCES

—PUBLICATIONS

The following publications are recommended reading for those who wish to broaden their capabilities by acquiring a foundational understanding of current topics and issues in health care performance improvement.

Health Care: The Journal of Delivery Science and Innovation

HealthCare: The Journal of Delivery Science and Innovation is a quarterly journal that promotes cutting edge research on innovation in health care delivery, including improvements in systems, processes, management, and applied information technology. The scope of the journal includes topics directly related to delivering health care, such as:

- Care redesign
- Applied health IT
- Payment innovation
- Managerial innovation
- Quality improvement (QI) research
- New training and education models
- Comparative delivery innovation

This journal supports open access, and many articles are available online for free. The journal can be accessed at https://www.journals.elsevier.com/healthcare-the-journal-of-delivery-science-and-innovation/.

The Journal of Clinical Outcomes Management

The Journal of Clinical Outcomes Management® (JCOM®) is an independent, peer-reviewed journal offering evidence-based, practical information for improving the quality and value of health care. This journal includes original research investigations that address questions about clinical care or the organization of health care and its impact on outcomes.

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IN THE NEXT ISSUE

The next issue of *Healthcare Analytics in Navy Medicine* will focus on pain management. The issue will discuss pain management policy and practice in the MHS, as well as considerations for the costs and quality of the services delivered in both the MTFs and purchased care. Additionally, data sources and data issues critical to the analysis of pain management services will be discussed.

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